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Profound Neonatal Anemia Due to a Fetal to Maternal Hemorrhage: A Case Study

Margaret Hogan Smoot

Terrance Zach

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Margaret Hogan Smoot, Dr. Terrance Zach
Creighton University School of Medicine,
CHI Health Creighton University Medical Center, Omaha, NE 68124

Introduction

Fetal to maternal hemorrhage (FMH), is fetal blood loss into the maternal circulation, occurring before or during delivery. Fetal blood transfer into the mother's bloodstream may likely occur in all pregnancies in small volumes due to placental leak during normal pregnancy and delivery. Moderate to severe fetal to maternal hemorrhage occurs in 0.3% of births, which are clinically significant, causing profound neonatal anemia.[1,2] No definition of severe FMH has been accepted, with many different volumes being used.[2] FMH is responsible for causing an estimated 14% of fetal deaths.[3] However, as FMH is not well understood, in part because diagnosis is difficult and highly physician dependent, the incidence of severe FMH incidence is likely underreported.[2,4] FMH has a vague presentation, with the most common symptom being decreased fetal movement. Diagnosis is most frequently made using the Kleihauer-Betke test which measures the amount of fetal hemoglobin in the mother's blood, however the test has multiple drawbacks. The consequences of significant FMH are potentially life threatening for the fetus or neonate, causing anemia or neurologic injury, among other serious complications.

Case History

- Female infant born at 36 weeks gestation with birth weight of 2580 grams
- Mother was 31 years old; gravida 1
- Mother reported decreased fetal movement 3 days prior and a quarter-sized amount blood-tinged mucous vaginal discharge 2 days prior.
- Non-stress test was non-reactive, and cesarean section was performed.
- Spontaneous cry, extremely pale, and mild respiratory distress at birth
- CPAP and supplemental oxygen given to infant
- Apgar scores were 8 and 8 at 1 and 5 minutes.
- CBC on admission showed profound neonatal anemia: Hb was 3.8 mg/dl; HCT 11.7%, reticulocyte 25.6%; and bilirubin 1.3 mg/dl.
- Given emergency transfusion of 15 mL/kg packed RBCs. Color and perfusion improved.
- Given second transfusion at 16 hours of age.
- Maternal Kleihauer-Betke test for HbF was 18% indicating a fetal to maternal hemorrhage as the cause of fetal anemia.
- Infant had a normal brain MRI on day 5.
- Infant discharged on day 8, feeding well.

Figure 1 Changes to hematocrit levels by age of newborn in hours

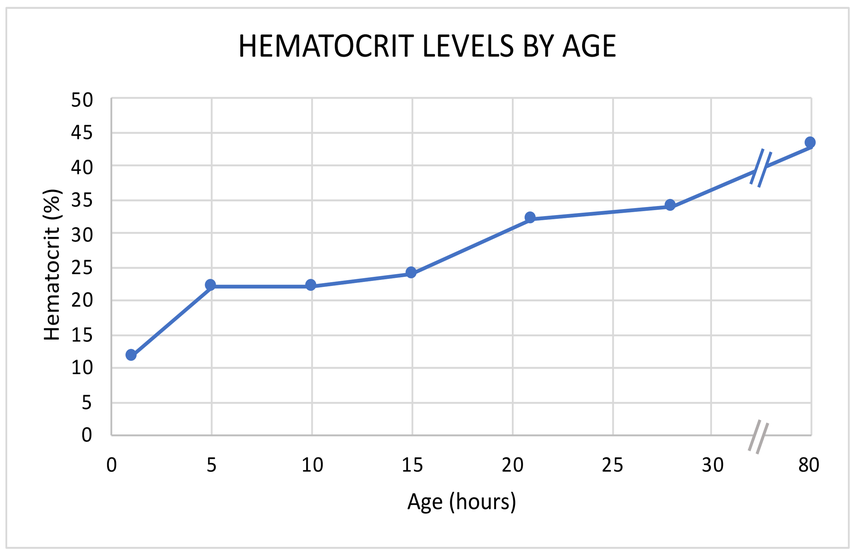
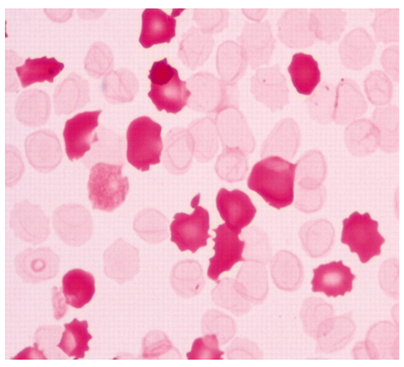


Figure 2

An example of a positive Kleihauer-Betke test: Fetal hemoglobin (HbF) in red blood cells is resistant to acid elution. Red blood cells which contain HbF will remain bright red, while those without HbF will appear colorless.



Discussion

- FMH presentation is often nonspecific and without a precipitating factor. Decreased fetal movement is the most common presentation, occurring in 25% of cases. Abnormal fetal heart rate has been associated with FMH and fetal anemia, however it is seen in less than 10%.[1] The vague presentation of FMH creates great difficulty in its diagnosis. The difficulty of prenatal diagnosis forces providers to rely heavily on postnatal clues, such as pallor and anemia in the neonate.
- When a non-stress test is non-reactive, a Kleihauer-Betke (KB) test should be performed.[5] This blood test measures the amount of fetal hemoglobin (HbF) present in the mother's bloodstream. The KB test is inexpensive and widely used, however it is labor-intensive, lacks standardization and results depend on the technician's skills.[6] It cannot be used if the mother has a condition with HbF such as sickle-cell anemia, beta thalassemia trait or hereditary persistence of HbF. An example of what a positive KB test looks like is shown in Figure 2.
- Flow cytometry can be used instead of KB test to diagnose FMH. Flow cytometry is faster and less labor-intensive, which raises its precision and accuracy, however it is not yet widely used. Neither test gives insight into when the hemorrhage occurred.[6]
- The outcomes of FMH are variable. Small hemorrhages may be common, and without any symptoms. However, larger hemorrhages can lead to severe fetal anemia. If not identified or treated properly, fetal anemia can lead to neurologic injury or death in the neonate. [2,4]
- A high level of suspicion must be kept to detect signs of FMH and action taken swiftly. If providers do not order FMH testing such as the KB or flow cytometry in response to neonatal anemia soon after birth, the diagnosis of FMH may be missed.

Conclusions

FMH is a severe phenomenon which is not well understood. It is difficult to recognize, likely underreported, and the current diagnostic testing is inadequate.

Due to its complexity and rarity, physicians and healthcare staff should be educated to promote detection of the vague presenting signs of FMH.

Further research should be done to determine the true incidence of significant FMH and better insight into clinical presentation.

Works Cited

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